UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/042,780	01/08/2002	Patrick Vandenameele-Lepla	020798-002100US	5185

27820 7590 11/01/2005

WITHROW & TERRANOVA, P.L.L.C.
P.O. BOX 1287
CARY, NC 27512

EXAMINER	
WONG, LINDA	

ART UNIT	PAPER NUMBER
2634	

DATE MAILED: 11/01/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/042,780	VANDENAMEELE-LEPLA, PATRICK	
	Examiner	Art Unit	
	Linda Wong	2634	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *05 August 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *2-30* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *2-4,6-11,13,14,16-20,22 and 24-30* is/are rejected.

7)☒ Claim(s) *5,12,15,21,23* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

1. Applicant's arguments with respect to claims 2-30 have been considered but are moot in view of the new ground(s) of rejection.

Claim Objections

2. **Claims 4,7,26,28** are objected to because of the following informalities:

   a. **Claim 4**, page 5, lines 9-12, recite the limitation of "the estimate of the channel transfer function" before the limitation "an estimate of the channel transfer function". It is suggested by the examiner on line 9, the limitation "the estimate of the channel function" should be changed to "an estimate of the channel function" and on line 12, the limitation "an estimate of the channel transfer function" should be changed to "the estimate of the channel transfer function" so to indicate that there is only 1 estimate of the channel transfer function being calculated and used as shown in Fig. 2.

   b. **Claim 7, page 6, line 9**, recites the limitation of "a channel estimate". As shown in Fig. 2, the channel estimate source outputs information to the carrier frequency offset and to the division or equalizer. Thus, only 1 channel estimate is calculated. It is suggested by the examiner that the limitation should be changed to "the channel estimate" since a channel estimate was already mentioned in page 6, line 7.

c. **Claim 26, page 26, line 19**, recites the limitation "... a loop filter coupled to the phase computation unit and configured to store a plurality of values of the phase..." It is well known that a loop filter does not store information. The term "store" should be changed to a more appropriate term so as to clarify the functionality of the loop filter.

d. **Claim 28, page 12, line 22,** recites the limitation "... configured to equalize the second parallel plurality of multi-carrier signals using the channel estimates ..." The phrase "the channel estimates" lacks antecedent basis. The phrase "the channel estimates" should be changed to "a channel estimates" since the phrase was no mentioned previously and as explained in the specification describing Fig. 2, the channel estimates used for equalization is different for the output from the channel estimator.

e. **Claim 28, page 12, line 13** recites the limitation "... and further configured to compensate for a carrier frequency offset and a clock offset using a carrier frequency offset estimate ..." The phrase "a clock offset" should be clarified as referring to the " a clock frequency offset" as disclosed in the specification.

Appropriate correction is required.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the

invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. **Claims 2,3 and 6** are rejected under 35 U.S.C. 103(a) as being unpatentable over Peeters et al (US Patent No.: 6628738) in view of Kumagai et al (EP Patent No.: 1172956A1) and further in view of Magee et al (US Publication No.: 20030086504).

   a. **Claim 2**, Peeters et al. disclose a multi-carrier transmission system associating and assigning weighting factors with values (Fig. 1, label WEIGHT) to each of a plurality of carriers of a multi-carrier data (Fig. 1, labels $MU'_0 - MU'_{N-1}$), measuring the noise of the carriers ((Fig. 1, label SNR) and assigning the selected value to the associated carrier (Fig. 1, labels SNR and Weight). Although Peeters et al discloses selecting the value inversely proportional to the noise power and assigning the weights, Magee et al discloses an OFDM system comprising assigning weights by measuring the noise, selecting a value inversely proportional to the noise power (page 6, paragraphs [0078], [0079] and [0080]) and assigning the selected value. (Fig. 7, 8 and page 6, paragraphs [0078],[0079], and [0080]) It would be obvious to one skilled in the art to assign a weighting value that is inversely proportional, disclosed by Magee et al, to the weight assigning calculations as disclosed by Peeters et al to compensate for interference found in the received signalby effectively measuring the noise. Although Peeters et al and Magee et al fail to teach a carrier frequency offset, Kumagai discloses an OFDM communication device comprising calculating the carrier frequency offset using the received signal (Fig. 10, labels 101 and 1003), channel estimate (Fig. 10, label 106) and the plurality of carrier-specific

weighting factors (Fig. 10, label 1001) and measuring the channel estimate or noise of the plurality of carriers. It would be obvious to one skilled in the art to combine Peeters et al and Kumagai's invention to reduce phase variation between subcarriers so as to improve the quality of the received signal.

b. **Claim 3**, Kumagai et al discloses a first subset of pilot carriers and a second set of non-pilot carriers (page 4, paragraph [0010]), comparing the signal with 16 reference signals to phase error and compensating the error by increasing or decreasing the first signal. (pages 4-5, paragraph [0018] and page 4, paragraphs [0010], [0011] and [0012])

c. **Claim 6,** Kumagai et al discloses calculating the phase compensation using the carrier frequency offset. (Fig. 12, labels 1204 and 109)

4. **Claims 4,7,9-11,14,16-17,19-20,22,24-27** are rejected under 35 U.S.C. 103(a) as being unpatentable over Kumagai et al (EP Patent No.: 1172956A1) in view of Peeters et al (US Patent No.: 6628738) and further in view of Belotserkovsky et al (US Patent No.: 6704374).

a. **Claim 4,** Kumagai et al discloses associating and assigning weights to pilot signals or carriers of the OFDM signal (page 6, paragraphs [0032]), calculating the carrier frequency offset by phase compensating the received signal (Fig. 14, labels 1302, and 1403), equalizing the phase compensated signal (Fig. 14, label 1401 and page 6, paragraphs [0032] and [0033] and page 20, paragraphs [0222] and [0223]), computing a phase metric (Fig. 14, output from label 1403)

from the phase compensated signal (Fig. 14, label 1302), the equalized signal (Fig. 14, output from label 1401), and the plurality of carriers, which is contained in the equalized signal (Fig. 14, output from label 1401), computing a phase of the phase metric (Fig. 14, label 904). Although Kumagai et al fails to disclose assigning and associating the weights as specifically recited, Peeters et al. disclose a multi-carrier transmission system associating and assigning weighting factors with values (Fig. 1, label WEIGHT) to each of a plurality of carriers of a multi-carrier data (Fig. 1, labels $MU'_0 - MU'_{N-1}$), measuring the noise of the carriers ((Fig. 1, label SNR) and assigning the selected value to the associated carrier (Fig. 1, labels SNR and Weight). It would be obvious to one skilled the art to incorporate the teachings of Peeters et al to Kumagai et al's invention to provide more robustness of the synchronization for noise near a pilot carrier. (Abstract, lines 10-12) Atlhough Kumagai et al fail to disclose a loop filter, Belostserkovsky et al discloses an OFDM receiver comprising correcting the carrier frequency offset of the received signal by calculating the phase error or phase compensation and loop filtering the phase error. (Fig. 3, labels 74 and 76 and Abstract, lines 1-3) It would be obvious to one skilled in the art to incorporate a loop filter to Peeters et al and Kumagai et al's invention to eliminate unwanted portions of the phase error.

b. **Claim 7** inherits all the limitations of claim 4, but claim 4 does not recite receiving the multi-carrier signal and estimating a clock frequency offset using the estimated carrier frequency offset. Kumagai et al discloses receiving the

multi-carrier signal and calculating the clock frequency offset using a carrier frequency offset. (Fig. 14, labels 1403 and 904 and page 21, paragraph [0227])

c. **Claims 9 and 10** inherit all the limitations of claim 3.

d. **Claim 11** inherits all the limitations of claim 4.

e. **Claim 14,** Kumagai et al discloses calculating a clock frequency offset using a factor inversely proportional to the carrier frequency offset. (pages 4-5, equation 5, paragraph [0018] and page 10, paragraph [0075])

f. **Claim 16**, Kumagai et al discloses computing a first and second carrier frequency error. Although Kumagai et al does not explicitly state calculating a coarse and a fine carrier frequency offset, it is possible that the first and second carrier frequency errors calculated can be fine and coarse carrier frequency offsets. Kumagai et al updates the phase compensation factor using both the first and second carrier frequency offset . (Fig. 12, labels 901, 1204, 904 and 109)

g. **Claim 17** inherits all the limitations of claims 7 and 1, but claims 7 and 1 fail recite estimating a channel transfer function. Kumagai et al discloses estimating a channel transfer function. (Fig. 1, label 106)

h. **Claims 19 and 20** inherit all the limitations of claim 3.

i. **Claim 22** inherits all the limitations of claim 14.

j. **Claim 24** inherits all the limitations of claim 11.

k. **Claim 25** inherits all the limitations of claim 17.

l. **Claim 26**, Kumagai et al discloses a weight source (Fig. 6, label 601), a slicer or smoother, which smoothes out error found in a signal so to lessen or eliminate the noise (Fig. 6, label 602 and page 14, paragraph [0126]), a phase metric updater (Fig. 6, labels 603 and 502) to receive the lurality of channel estimates (Fig. 6, label 106), the phase compensated signal (Fig. 6, label 109), the sliced signal (Fig. 6, label 602), and the plurality of carrier-specific weights (Fig. 6, label 601), a phase computation unit coupled to the phase metric updater (Fig. 6, label 503). Although Kumagai et al does not disclose a loop filter, Belostserkovsky et al discloses an OFDM receiver comprising correcting the carrier frequency offset of the received signal by calculating the phase error or phase compensation and loop filtering the phase error. (Fig. 3, labels 74 and 76 and Abstract, lines 1-3) It would be obvious to one skilled in the art to incorporate a loop filter to Peeters et al and Kumagai et al's invention to eliminate unwanted portions of the phase error.

m. **Claim 27**, Kumgai discloses calculating the channel noise. (Fig. 6, label 106)

5. **Claims 8 and 18** are rejected under 35 U.S.C. 103(a) as being unpatentable over Kumagai et al (EP Patent No.: 1172956A1) in view of Peeters et al (US Patent No.: 6628738), further in view of Belotserkovsky et al (US Patent No.: 6704374) and further in view of Magee et al (US Publication No.: 20030086504).

a. **Claim 8** inherits all the limitations of claim 1.

b. **Claim 18** inherits all the limitations of claim 1.

6. **Claim 13** is rejected under 35 U.S.C. 103(a) as being unpatentable over Peeters et al (US Patent No.: 6628738) in view of Kumagai et al (EP Patent No.: 1172956A1), further in view of Belotserkovsky et al (US Patent No.: 6704374) and further in view of Iowegian International (Publication: "dspGuru: Infinite Impulse Response Filter FAQ").

   a. **Claim 13**, Although Belotserkovsky et al does not explicitly state the type of filter, the loop filter can be an infinite impulse response (IIR) type filter. It would be obvious to one skilled in the art to use an IIR loop filter to "achieve a given filtering characteristic using less memory and calculations." (Lowegian International)

7. **Claims 28-30** are rejected under 35 U.S.C. 103(a) as being unpatentable over Hampel et al (US Patent No.: 6442211) in view of Ghosh et al (US Publication No.: 20030112902) further in view of Kumagai et al (EP Patent No.: 1172956A1), and further in view of Peeters et al (US Patent No.: 6628738).

   a. **Claim 28**, Hampell et al discloses a muti-carrier data communication system comprising a transmitter including a modulator/deserializer (Col. 2, lines 57-67 and Fig. 1, label 7), a frequency-domain to time domain converter (Fig. 1, label 13), a serializer (Fig. 1, label 15, a digital to analog converter (Fig. 1, label 17), a receiver including an analog to digital converter (Fig. 1, label 19, a deserializer (Fig. 1, label 21) and a serializer/demodulator (Fig. 1, label 30 and Col. 3, lines 30-37). Although Hampel et al does not disclose all the limitations

recited, Ghosh et al discloses a transceiver comprising a transmitter including a guard period insertion coupled to a frequency domain to time domain converter (Fig. 1, labels 109 and 110), a receiver comprising a channel estimator (Fig. 1, label 112a) coupled to a guard period (Fig. 1, label 113a). It would be obvious to one skilled the art to incorporate the components found Ghosh et al to Hampel et al's invention to provide performance improvements over multiple antenna systems. (Abstract, lines 9-10) Although Hampel et al and Ghosh et al does not disclose an equalizer, Kumagai et al discloses an equalizer coupled to a frequency to time converter (Fig. 1A, label 105), wherein the equalizer comprises using channel estimates (Fig. 6, label 106) and computing a compensation for a carrier frequency offset and a clock frequency offset using the carrier frequency offset (Fig. 14, labels 1403 and 904 and and page 6, paragraphs [0032] and [0033] and page 20, paragraphs [0222] and [0223]). It would be obvious to one skilled in the art incorporate computing the equalizer as disclosed by Kumagai et al to Hampell et al and Ghosh et al's invention to Although Kumagai et al does not explicitly state assigning each weighting factor to a different carrier, Peeters et al discloses assigning each weighting factor to a different carrier. (Fig. 1, labels WEIGHT and $MU'_0 - MU'_{N-1}$) It would be obvious to one skilled in the art to incorporate a loop filter to Peeters et al and Kumagai et al, Hampell eta land Ghosh et al's invention to eliminate unwanted portions of the phase error.

b. **Claim 29**, Kumagai et al discloses a preliminary carrier frequency offset, wherein such a computing computing such an offset is coupled to a guard period removal block and a receive circuit. (Fig. 1A, labels 102 and 104 and Fig. 17, label 901) Although Kumagai et al does not explicitly state a deserializer with the receive circuit, Hampel et al discloses a deserializer within the receiver. (Fig. 1, label 21) It would be obvious to one skilled in the art to include recover the received signal so to effectively compute and decipher the information transmitted.

c. **Claim 30**, Kumagai et al discloses using the preliminary estimate of the carrier frequency offset to calculate the carrier frequency offset. (Fig. 13, labels 1301, 1302 and 902)

Allowable Subject Matter

8. **Claims 5,12,15,21 and 23** are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Linda Wong whose telephone number is 571-272-6044. The examiner can normally be reached on 9-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stephen Chin can be reached on (571) 272-3056. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

STEPHEN CHIN
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2600